

REMARKS

Claims 1-16 are pending in this application. Claims 1-13 are rejected. Claims 14 and 15 are objected to. Claim 16 is allowed.

With this Amendment, claim 1 has been amended. Support for this amendment can be found in at least paragraphs 6, 7, and 18.

The Applicant would like to thank the Examiner for allowing claim 16 and indicating that claims 14 and 15 would be allowable if written in independent form.

Rejection under § 103(a) over Okuhara in view of Richardson

The Examiner has rejected claims 1-4, 8, 11, and 12 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,447,373 to Okuhara ("Okuhara") in view of U.S. Patent No. 5,709,474 to Richardson ("Richardson").

Regarding claim 1, the Examiner states that Okuhara discloses or suggests all the limitations including a device for measuring temperature in a metal melt, that has an optical fiber connected directly or indirectly to a measurement instrument and held by a carrier, the optical fiber having an immersion end which is guided through a melt consumable body, wherein the consumable body exhibits a consumption rate in the melt wherein the consumption rate is approximately equal to or greater than a rate at which the optical fiber is destroyed. The Examiner further states that Richardson discloses a consumable refractory sheath for protecting sensors in a molten metal. The Examiner also states that Richardson is evidence that ordinary workers in the field of temperature measurement recognize the benefit of using the reinforced body as taught by Richardson for the body of Okuhara in order to enable longer measurement time before the sensor is destroyed by the molten metal. The Examiner concludes by saying that it would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute a reinforced body for the paper body of Okuhara in order to enable longer measurement time before the sensor is destroyed by the molten metal as taught by Richardson. Applicant respectfully traverses the rejection and the arguments in support thereof as follows.

With respect to Okuhara, this reference fails to teach that the optic fiber is in contact with the molten metal as recited in claim 1 of the present invention. In fact, Okuhara teaches away

from the present invention by including a quartz cap which prevents the molten steel from establishing contact with the optical fiber, and therefore the optical fiber is protected and is prevented from being destroyed. (Col. 2, lines 23-31) This is different from the present invention because in the present invention the optical fiber is allowed to be destroyed. As recited in claim 1, the optical fiber and the consumable body are destroyed at a rate of no more than 10 cm/min. Further, Richardson does not supply the missing element(s) because it does not disclose an optical fiber at all. Therefore, claim 1 is not obvious over Okuhara in view of Richardson whether considered separately or together.

Regarding claims 2-4, 8, 11 and 12, because they are dependent on claim 1 which is unobvious over Okuhara in view of Richardson, these claims are therefore unobvious over Okuhara in view of Richardson. Therefore, it is respectfully requested that the rejection of claims 1-4, 8, 11, and 12 be removed and that the claims be allowed.

Rejection under § 103(a) over Okuhara in view of Richardson, further in view of Takayama

The Examiner has rejected claims 5-7 under 35 U.S.C. § 103(a) as being unpatentable over Okuhara in view of Richardson et al. and further in view of U.S. Patent No. 6,004,031 to Takayama et al. ("Takayama"). The Examiner argues that Okuhara discloses all of the limitations of claims 5-7, except that Okuhara does not explicitly state the materials of the fiber. The Examiner also states that Takayama discloses that it is known in the art to provide a quartz fiber with a steel covering in order to delay the consumption of the fiber in the case of immersion of the fiber in a molten metal. The Examiner concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to delay the consumption of the fiber in the case of immersion of the fiber in a molten metal as taught by Takayama. Applicant respectfully traverses this rejection and the arguments in support thereof as follows.

Claims 5-7 are based on claim 1 directly (claims 5 and 6) and indirectly (claim 7). Claim 1 is distinguished over the cited prior art, including Takayama, for the reasons discussed above. Therefore, claims 5-7 are patentable and it is respectfully requested that they be allowed.

Rejection under § 103(a) over Okuhara in view of Richardson, further in view of Sato

The Examiner has rejected claims 9 and 13 under 35 U.S.C. § 103(a) as being unpatentable over Okuhara in view of Richardson and further in view of JP 56-117134 to Sato

("Sato"). The Examiner argues that Okuhara discloses all of the limitations of claims 9 and 13, except that Okuhara does not disclose that the detector is arranged in the consumable body as in claim 9 or that the electrical/optical lines in the consumable body are connected by electrical/optical contacts to a connector in the carrier as in claim 13. The Examiner also states that Sato discloses that it is known in the prior art to provide a dipping probe with a detector arranged in the carrier part instead of arranging the detector in the consumable body. The Examiner further states that Sato also discloses that the optical signal line is connected by an optical contact to a connector in the carrier which includes the pole, enclosing the transducer (detector), which functions as an optical connector. The Examiner concludes that it would therefore have been obvious to shift the position of the detector of Okuhara from the outside of the probe to the inside of the consumable body in order to require less optical fiber. Applicant respectfully traverses this rejection and the arguments in support thereof as follows.

Claims 9 and 13 are based on claim 1 indirectly (claim 9) and directly (claim 13). Claim 1 is distinguished over the cited prior art, including Sato, for the reasons discussed above. Therefore, claims 9 and 13 are patentable and it is respectfully requested that they be allowed.

Rejection under § 103(a) over Okuhara in view of Richardson, further in view of Nagai

The Examiner has rejected claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Okuhara in view of Richardson and further in view of U.S. Patent No. 5,158,366 to Nagai et al. ("Nagai"). The Examiner argues that Okuhara discloses all of the limitations of claims 1-4, 8, 11 and 12, except that Okuhara does not disclose the further limitation wherein a consumption sensor is arranged in the consumable body. The Examiner argues that Nagai discloses that it is known in the art to provide a device for measuring temperature in a metal melt with a consumption sensor arranged in the consumable body in order to detect erosion to discriminate the extent of the consumption of the consumable body. The Examiner then concludes that it would have been obvious to one skilled in the art to add the consumption sensor arranged in the consumable body of Okuhara in order to detect erosion in the body to discriminate the extent of the consumption of the consumable body as taught by Nagai. Applicant respectfully traverses this rejection and the arguments in support thereof as follows.

Claim 10 is based on claim 1 directly. Claim 1 is distinguished over the cited prior art for the reasons discussed above. Further, claim 1 is distinguished over Nagai because Nagai does

not disclose an optical fiber to measure temperature differences. Nagai uses a measurement of a variation in electrical resistance between two or more metal members to detect temperature and the metal members are encapsulated in refractory. Therefore, claim 10 is patentable and it is respectfully requested that it be allowed.

Objection to Claims 14 and 15

The Examiner has indicated that Claims 14 and 15 contain allowable subject matter but they are objected to because they are based on rejected claim 1. Applicants appreciate this indication. However, because claim 1 is not obvious as argued above, applicants respectfully request that the objection be removed and that the claims be allowed.

In view of the above arguments it is respectfully submitted that all of the claims are unobvious over the cited prior art and that each of them are in condition for allowance.

Respectfully submitted,

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